

We cannot here discuss the detailed arguments of the book, but the author's standing requires that we should at least indicate the general trend. The chapters run:—the nature of the problem, our bodily frame, our life, our embryonic development, the history of our species, the nature of the soul, psychic gradations, the embryology of the soul, the phylogeny of the soul, consciousness, the immortality of the soul, the law of substance, the evolution of the world, the unity of nature, God and the world, knowledge and belief, science and Christianity, our monistic religion, our monistic ethics, solution of the world-problems. It is from the last chapter that we select a quotation which sums up the author's position.

"Towering above all the achievements and discoveries of the century, we have the great, comprehensive 'law of substance,' the fundamental law of the constancy of matter and force. The fact that substance is everywhere subject to eternal movement and transformation gives it the character also of the universal law of evolution. As this supreme law has been firmly established, and all others are subordinate to it, we arrive at a conviction of the universal unity of nature and the eternal validity of its laws. From the gloomy *problem* of substance we have evolved the clear *law* of substance. The monism of the cosmos which we establish thereon proclaims the absolute dominion of 'the great eternal iron laws' throughout the universe. It thus shatters, at the same time, the three central dogmas of the dualistic philosophy—the personality of God, the immortality of the soul, and the freedom of the will" (pp. 388–389).

There seems some need here for a criticism of categories, but we make only two remarks.

Since, as Haeckel says, "no scientist ever asks seriously of the 'purpose' of any single phenomenon," since, in other words, science does not discuss the meaning or significance of experience, it is obviously *as a philosopher* that he seeks to demolish the ancient beliefs, and there will no doubt be found those who, while bowing to his scientific authority, will prefer Kant or some other as their philosophical guide.

Secondly, to scientific minds who regard laws of nature as merely conceptual formulæ summing-up certain sequences of experience, it may seem that to replace "a deliberate architect and ruler of the world" by "the eternal iron laws of nature" is to be guilty of an anthropomorphism precisely analogous to those on which the illustrious author pours contempt. Altogether, this endeavour to give monism to the multitude seems to us to bear an unfortunate resemblance to the device of trying to pay debts by means of an overdraft without first facing the question of general solvency.

When we say that we do not find in this volume any solution of any of the riddles of the universe, we mean no particular reproach against the author, for he is a scientific worker, and we do not think that it is within the scope of science to solve "Welträthsel." In other words, we adhere to the position that "all science is description, not explanation." If the phenomena which we label gravitational or evolutionary were once riddles, they remain so, although Newton and Darwin have given us what Karl Pearson calls thought-economising devices for dealing with them.

The book falls short of its high ambition because it is neither scientific enough nor philosophical enough to win conviction. It is not scientific enough, since mere

formulæ (endowed with "eternal validity") stalk through the book, doing this and doing that, like the Greek gods come back again, and since when the well-known difficulties raised by the "big lifts" in the great process of Becoming have to be faced, the author has no new light to offer (we are not forgetful of his illuminating work in the past), but simply rubs his lamp and summons the two genii, Substance and Evolution, and the work is done. In plain fact, Evolution travels through the book like a creator in disguise. There is many a quaint illustration of the metaphysician unconscious of himself, as when the author, after referring the doctrine of the conservation of matter and energy (his "law of substance" or "fundamental cosmic law") to Lavoisier, Helmholtz and others, says: "In the ultimate analysis it is found to be a necessary consequence of the principle of causality."

Nor does the book seem to us philosophical enough; it does not even show an appreciation of the philosopher's problems. In confessing that we are as far from understanding "the innermost character of nature," "the problem of substance" as Anaximander and Empedocles were 2400 years ago, Haeckel says:—

"We do not know the 'thing-in-itself' that lies behind these knowable phenomena. But why trouble about this enigmatic 'thing-in-itself' when we have no means of investigating it, when we do not even clearly know whether it exists or not."

Now many who agree with this assumption of the futility of the "things-in-itself" may at the same time doubt whether the philosopher troubles himself much about it either, whether this is not mere bluffing in presence of the fact that our "routine of perceptions" *is* a problem (not to be ignored, even if insoluble), whether transcendental formulæ have no utility because scientific formulæ (e.g. atomic theories, ether theories, &c.) seem to many minds to have much, and whether the position indicated is consistent with the energy expended throughout the book in "shattering" Christian and other philosophies of life which have obviously no standing if from the outset the problem of the significance and meaning of experience is ruled out of court as an irrelevancy. One feels that the author has not quite learned the "rules of the game" when he is satisfied with saying in answer to idealistic monism:—

"In my opinion the existence of ether is as certain as that of ponderable matter—as certain as my own existence, as I reflect and write on it. As we assure ourselves of the existence of ponderable matter by its mass and weight, by chemical and mechanical experiments, so we prove that of ether by the experiences and experiments of optics and electricity."

But this is just Dr. Johnson and Bishop Berkeley over again, and no idealist will so much as turn a hair.

SCHMEIL'S TEXT-BOOK OF ZOOLOGY.

A Text-book of Zoology; treated from a Biological Standpoint. By Dr. O. Schmeil. Translated by R. Rosenstock, and edited by J. T. Cunningham. Parts ii. and iii. Reptiles to Invertebrates. (London: A. and C. Black, 1900.)

THE first part of this school text-book was noticed in our issue of August 23, 1900, and with the publication of Part iii. the work is completed. Considering

the fulness with which it is illustrated, and the somewhat restricted circulation of treatises devoted to zoological subjects, the work is a marvel of cheapness; and the manner in which it is turned out reflects the greatest credit on the publishers. Allusion has been previously made to the popular and interesting style in which it is written; and as examples of clear and accurate treatment of somewhat difficult subjects we may call attention to the description, in Part ii., of a bird's respiration while on the wing, and the manner in which the flight-feathers present either an impervious barrier or an easily traversed sieve to the air according to the exigencies of flight at the moment. The descriptions of these functions are, indeed, decidedly better than in any other text-book with which we are acquainted; and they are by no means solitary instances, both in the vertebrate and invertebrate parts. Again, the diagram of the circulation of the carp on p. 274 may be cited as an excellent example of clearness. And it may be confidently affirmed that, so far as physiology and habits are concerned, the work is for the most part all that can be desired.

But physiology and the description of the habits of animals, although of the highest importance, by no means constitute the whole of zoology; and whether the subject be treated from a "biological" or from any other standpoint, there can at the present day be no sort of excuse for the numerous omissions and inaccuracies which occur in the systematic portion of Part ii. Even if the author's acquaintance with systematic zoology were insufficient to enable him to recognise these shortcomings, it should have been, as we said before, a part of the editor's task to see that these were remedied in the English translation.

Were we so disposed, we could seize many opportunities of finding fault with the generic and specific nomenclature employed; but we will let such minor matters pass without notice, and content ourselves with calling attention to other points.

Taking first the section on birds, we find that not only is the classification of a decidedly antiquated type, and very different from any of those commonly employed, but that it also contains several errors and inconsistencies. The group "*Impennes*," for example, was formed in 1811 by Illiger for the penguins, but in the present work (p. 225) we find it typified by the divers, which, together with the grebes, constitute Illiger's "*Pygopodes*"! Nor is this all, for whereas the "*Impennes*" are termed "*Divers*," yet no representative of the divers proper (*Colymbidæ*) is referred to in the work; the notice of the group commencing with the grebes, which are followed by the auks, and these, again, by the penguins—the typical and sole representatives of the entire order. Take, again, the case of the gulls or "*Lariform*" birds (page 223). Here we have first an account of the herring-gull, followed, under the head of "allied species," with a brief mention of the black-headed gull and the albatross. Of course, it is justifiable to follow Dumeril in including both the gulls and the albatross in a single group (*Longipennes*), but the reader should have been informed that, according to the universal usage of British ornithologists, the albatross and the other petrels are separated from the gulls as a distinct order (*Tubinares*).

To take a third instance, those responsible for the book may, if they please, follow the totally obsolete system of including the so-called American vultures (*Cathartidæ*) among the *Vulturidæ*, or true vultures of the Old World. But there is no justification whatever for taking the condor as the sole example of the latter family, and avoiding all mention of a single species that really belongs to it! And here it may be remarked that we think ornithologists would be well advised if they discarded the use of the name "*Vultures*" for the *Cathartidæ*, and called them all "*Condors*." Misprints, we are glad to notice, seem few and far between in this and the other sections of the book, but *Alaudictæ*, in place of *Alaudidæ* (p. 181), should have caught the proof-reader's eye.

Passing on to the section on reptiles, we have to deplore the use of an antiquated and discredited classification, the groups *Ophidia* and *Lacertilia* being regarded as of equal value with *Crocodylia* and *Chelonina*. But even more serious is the total absence of the *Rhynchocephalia* among the ordinal groups of the *Reptilia*, its single representative, the New Zealand tuatara, being, so far as we can see, not even mentioned in the book! Surely, even from a "biological standpoint," such a remarkable creature is worthy of some notice in a "zoological text-book!"

Nor are minor points for criticism lacking in this section. For instance, on p. 246, the account of the American alligator is simply ludicrous; while the reader should have been informed that an allied species occurs in China. Again, had the editor taken the trouble to refer to the British Museum "*Catalogue of Chelonians*," he would have found that there is no justification for the use of the name "*Chersidæ*" for the land tortoises (p. 250), and also that in place of *Testudo indica* being the proper title for the "giant tortoises" of the Galapagos Islands, that name denotes an extinct species from the Mauritius.¹

Omitting mention of the Amphibians (not because there is no room for criticism), a few remarks are called for in the section devoted to fishes. Here the up-to-date zoologist can scarcely fail to be surprised to find the group divided into (1) bony fishes, (2) enamel-scaled fishes, (3) sharks and rays, (4) round-mouthed fishes, and (5) lancelets, without the slightest indication as to differences in the value of such divisions. To those who have kept themselves at all abreast of modern zoological research, it is almost inconceivable that such a classification should be presented to students.

As regards the details of the class in question, it is decidedly strange to find the "enamel-scaled" group exemplified by the sturgeons, while the two living types (bony pike and bichir) which alone retain scales of this description are totally ignored; and surely the unique type of limb-structure presented by the latter alone among modern fishes should have itself entitled the creature to special mention. Even more startling is the omission of any reference to the lung-fishes (*Dipnoi*), which we presume the author would include in the "enamel-scaled" group, although the student is left entirely in the dark on this important point.

Without in any way wishing to be unduly severe, we

¹ Neither the popular nor scientific name of this reptile occurs in the index.

can scarcely refrain from saying that in the second part of the work the author seems to have gone out of his way to ignore some of the most peculiar, and therefore the most instructive, types of reptile and fish life.

As regards Part iii., which deals with invertebrates, we feel ourselves less qualified to speak authoritatively either in respect to the excellence of treatment or the reverse on the part of the author, and therefore refrain from detailed criticism. So far, however, as we can judge, the classification adopted is, in some respects, less open to objection than is that of the vertebrates. Even here, however, the author gives opportunity for criticism in many places. For example, among the molluscs no mention is made of Dentalium, which most modern zoologists regard as the representative of an order by itself. And it is scarcely consonant with the facts to say (p. 445) that Ammonites "were animals similar to the nautilus in all essentials of form and structure," unless, indeed, the author attaches a very different meaning to the word "essential" than we are disposed to assign to it. But the most astounding feature in the whole book is the total omission of the Brachiopods, the Tunicates, and the Polyzoans!

At the end of the work two pages are devoted to geographical distribution. Here it will surprise many zoologists to find the domesticated zebu given as one of the characteristic animals of the Indian region, and "the antelope" as one of those of Africa. Neither is it apparent why the leopard and the panther are included among the characteristic mammals of Africa as distinct from India. Again, the statement (p. 485) that "tracts of land (e.g. the Sahara) have been elevated out of the ocean" may be cited as an extremely unfortunate one, having regard to modern views as to the origin of deserts.

If the editor in his preface is justified in his statement that "the book is far superior in many respects to any other elementary text-book of the subject known to me," we may be permitted to add that in other respects it is decidedly inferior to several works of the like nature that could be named.

R. L.

OUR BOOK SHELF.

The Mycetozoa and some Questions which they Suggest.

By the Right Hon. Sir Edward Fry, D.C.L., LL.D., F.R.S., F.L.S., and Agnes Fry. Pp. viii + 82. (London: Knowledge Office, 1899.)

"WHAT'S in a name?" Much, when it bars the way to the knowledge of a group so rich in curious and beautiful forms, and so important in the information that it can afford upon the nature of protoplasm. The want of a familiar name has led the authors to employ "myxies," and the word may find acceptance, as it is not hard to pronounce or remember, while it has the advantage of leaving open the question of what their pets are. Though generally reckoned now among plants, they are so different from even the nearest groups that they may well receive a neutral name.

They have formed the subject of very excellent monographs in various languages, and to these the student must turn who wishes to investigate the Mycetozoa thoroughly. But the very excellence of these monographs renders them unsuitable to those that wish only such a general outline as will place the group in true perspective in its relation to other low forms of living

beings, and will indicate its value in the study of living protoplasm in simple organisms. There was room for a small book that would give such an outline, and this little work has been written to do so. One cannot read it without recognising that it is the work of enthusiasts whose aim is to communicate to others the pleasure gained by themselves in the study. But no less evident is the clearness of statement of the points of chief interest resulting from width of view and facility of expression. One can recognise that it is the work of amateurs by occasional slips, as on p. 35, where it is stated that all plants with a square stem and lipped flowers belong to the family of the Labiatæ. But such slips are few, and no one can read the book without interest, while those not already familiar with the Mycetozoa will have gained as clear a conception of their nature and scientific interest as can be acquired without actual personal study of these organisms. The descriptions are supplemented by figures admirably selected and executed. The book is one that should induce those who read it to desire a fuller knowledge and to become students themselves. It will be found an excellent introduction to the study of a most interesting group.

A School Chemistry. By Dr. John Waddell. Pp. xiii + 278. (New York: The Macmillan Co., 1900.)

MANY text-books of physics and chemistry are now constructed upon the interrogatory plan. Judiciously used, the method has real educational advantages, for it makes the student think for himself instead of merely using his brain as an absorbing medium for what he reads or is told. But the Socratic principle is often overdone. The questions which a teacher asks—either in book or verbally—in connection with experiments in progress, are frequently not those which present themselves to the mind of the student. True, by suggesting questions the pupil can be led to see the main points to be brought out, and to have an interest in finding answers to them; but the ideal plan is to let his own mind do the questioning instead of the mind of the teacher. While, therefore, we agree that the interrogative method largely employed by Dr. Waddell is often stimulating, and certainly much better than the plan of former text-books for schools, we do not believe it is altogether satisfactory.

Consider a boy in a laboratory, with Dr. Waddell's book open at Experiments 9 and 10 (Chap. ii.). The experiments are on the decomposition of water by potassium and sodium, and will often result in accidents unless performed under the eye of the teacher. But leaving this out of account, let us see the questions asked in the course of the description of Experiment 10; they are as follows: "Does the potassium sink in the water, or does it float? What colour has the flame? . . . What shape does the sodium assume? Note how far it acts like potassium, and how far it differs. Is there a flame? Try the experiment with *hot* water. . . . Why is there a flame in some cases with the sodium and not with others? What is the colour of the flame? Does sodium or potassium act the more violently on water?" Now a question we would ask is: How is the pupil to give his answers? Is he supposed to write a reply to each interrogation, or merely to make a mental note of it? If the former, then the pupil must soon get weary of the obstacles offered to the progress of his practical work by the everlasting questions prompted, not by his own curiosity, but by a book. In fact, we do not believe it is possible to carry out the Socratic method of science instruction successfully by means of a text-book. The spirit of inquiry must come from within, or be inspired by a teacher watching the progress of an experiment.

It must not, however, be concluded from the foregoing that Dr. Waddell's book is destitute of the elements of